Sustainable Food Sourcing in Higher Education: Definition and Goal-setting for Duke University

By

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Dr. Charlotte Clark, Adviser

May 2014

Masters project submitted in partial fulfillment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment of Duke University

2014

Abstract

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Food production is one of the most impactful parts of human's footprint, both on our environment and our social structure. Knowing this, many colleges and universities are enacting sustainable purchasing guidelines and procurement goals in dining services to decrease the negative externalities of food consumption on campus. This study used semi-structured interviews, focus groups, and collection of material culture to evaluate Duke University's current sustainable food procurement initiatives and to research how peer institutions create and track progress towards sustainable food goals. Based on this research, I recommend a definition of sustainable food for Duke University in six product categories. I also give broad guidelines for "best practices" in setting and maintaining sustainable sourcing goals in dining services.

Approved: _____
Dr. Charlotte Clark

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Table of Contents

Introduction

Food purchasing decisions are one of the most impactful ways consumers influence the global environment (Brower & Leon, 1999). Knowing this, many colleges and universities are enacting sustainable purchasing guidelines and procurement goals in dining services to decrease the negative externalities of food consumption. Sustainable food is a broad concept that is defined variably by different organizations. However, generally, the term encompasses the desire to produce and consume food that is environmentally responsible in the way it is grown and harvested, economically viable in the way it is marketed and sold, and socially responsible in the way that the farm workers and livestock are treated. The Duke University Sustainability Office, Sustainable Duke, desires to include sustainable food procurement in a broader Sustainability Plan for the campus. I conducted this research to understand how Duke should define sustainable food and should set goals around sustainable food procurement. This study has three main objectives:

- Evaluate the strengths, weaknesses, opportunities and threats of current efforts to sell sustainable food at Duke.
- Research how other schools are defining sustainable food and incorporating sustainable food procurement into their Sustainability Plans.
- Determine feasible definitions and goals for Duke Dining around purchasing sustainable food.

The analysis includes recommendations for Duke's Campus Sustainability Committee and Duke Dining Services to enact sustainable purchasing guidelines.

Background

How does food impact the environment?

Food production is one of the most impactful parts of human's footprint, both on our environment and our social structure. Water use and pollution, soil health and erosion, and

greenhouse gas emissions are key components of this impact. Agriculture is a main user of water, as over 40% of water withdrawal in the United States can be attributed to agricultural uses (FAO, 2013). Due to increasing use of intensified agriculture, nearly 40% of global soils have become "seriously degraded" since 1945 (Magdoff & Es, 2009). This soil degradation, as well as deforestation and animal manure, attribute one-third of global greenhouse gas emissions (Verge, CD, & Desjardins, 2007).

Crop production not only uses large amounts of water, but often degrades water quality. Nitrogen and phosphorous are macronutrients for plant growth, and are incorporated into fertilizer for the effective production of food. However, if growers over-apply fertilizer, it can be lost to the environment through water run-off or atmospheric emissions. Agricultural run-off creates nutrient loading in water bodies that degrade, rivers, streams, lakes, and estuaries. The EPA estimates that 53% of rivers and streams and 67.6% of lakes, reservoirs, and ponds have impaired water quality; one of the leading causes of these impairments is agricultural run-off (US EPA, 2012). This nutrient loading can lead to hypoxic aquatic conditions, as algae rapidly bloom with excess nutrients and then respire, depleting dissolved oxygen. Due to nutrient loading in the Mississippi River, the Gulf of Mexico has a large annual hypoxic area, or "dead zone." The Mississippi River flows through the Corn Belt of the United States, accumulating nutrients from farm run-off and eventually depositing them in the Gulf of Mexico. The size of the annual hypoxic zone in the Gulf of Mexico corresponds to the amount of flow from the Mississippi River (Diaz & Rosenberg, 2008). Scientists have seen hypoxic conditions in the Gulf since the 1970s, with an annual loss of 17,000 metric tons of benthic biomass that leaves less food sources available for demersal fisheries (Diaz & Rosenberg, 2008).

Soil health is another key component of agricultural impacts. Elements of healthy soils are good tilth, presence of microorganisms and soil organic matter, high cation exchange capacity, and stable soil acidity (pH) (Magdoff & Es, 2009). These characteristics allow water and nutrients to infiltrate through the soils and to the root systems, creating strong growing environments for plants. Without these characteristics, soils are less likely to produce high yielding crops and more likely to erode. Currently, soils are eroding one to two times faster than they can be replenished (Montgomery, 2007). An estimated 16% of agricultural land in the world has yield loss due to degraded soils, equating to over $1 billion in lost revenue (Magdoff & Es, 2009).

Finally, food production often has a large carbon emission footprint. Just as over-application of nitrogen can create water pollution through run-off, it can also volatilize into nitrous oxide, a greenhouse gas about 300 times more potent than carbon dioxide. Nitrogen uptake is particularly low in corn, with about only 50% N-efficiency (Cornell University, 2011). Waste and enteric fermentation from livestock creates methane emissions, and land use change emissions from clearing forested areas for agricultural production lead to loss of carbon sinks and emissions from newly exposed soils. Taken together, these greenhouse gases account for one-third of the annual greenhouse gas emissions globally (Verge, CD, & Desjardins, 2007). Post-agricultural production, food processing, packaging, and transportation emissions to get goods from production areas to the consumer's plate yield further greenhouse gases (Center for Sustainable Systems, 2012).

Future projections appear to pose additional challenges for the environment-agriculture intersection. By 2050, world population will reach 8.9 billion people, compared to the current 7 billion (United Nations, 2004). More people will live in urban regions, and 3 billion more people

will live in higher income bracket by 2050 (Ward & Neumann, 2012). The growth of the middle class population in emerging economies such as China, India, and Brazil will impact food consumption patterns (Senauer & Goetz, 2003). As incomes increase, populations consume more red meat and other "high-value" products that tend to have larger environmental footprints (Senauer & Goetz, 2003). The growing middle class's new taste for higher-quality food, such as meat and dairy, will create additional demands on the environment. Beef is the food item with the largest environmental impact, followed by cheese, fish and dairy (Baroni, Cenci, Tettamanti, & Berati, 2007). As populations eat more of these products, they will have a larger impact on environmental degradation.

These demographic trends will create additional pressure on our global food supply. Projections indicate that nitrogen fertilization will increase 2.7 fold, phosphorous by 2.4 fold, and irrigated land by 1.9 fold by 2050. Humans will require 18% more agricultural land by 2050, which equates to the size of the United States being converted for food production purposes (Tilman, et al., 2001). Projected climate change will impact global food productivity, with changes in precipitation and increased temperatures likely to decrease crop yield (Battisti & Naylor, 2009). Given the large environmental impact of food and the projected future increased demands in food production, changes must be made to ensure the human population can feed itself without ruining the natural resources upon which we depend.

Food's Non-environmental Impact

Beyond the environmental footprint, our food resources have a large social impact as well. Conventional meat production in confined animal feeding operations (CAFOs) has many inhumane aspects. Ninety-nine percent of farm animals never spend time outdoors (Matheny and Leahy 2007). To achieve maximum feed efficiency, the animals are injected with hormones to increase growth. Rapid growth causes skeletal, respiratory and cardiovascular disease, but

livestock rarely receive veterinary attention. With over nine billion farm animals in the U.S., only 220 veterinarians serve these animals (Matheny and Leahy 2007).

Human mistreatment within the food production supply chain is also prevalent, especially for farmworkers. Approximately three million farmworkers live in the United States, with about 150,000 of those living in North Carolina. The average wage for these workers is $11,000 annually. They often work long hours, live in unsanitary conditions, and are exposed to pesticides and other agricultural toxicants both at work and at home (NC Farmworker Justice Institute, 2014). Human trafficking and slavery exists in the agricultural sector as well (Polaris Project, 2014). These laborers experience force or coercion from agricultural companies to keep them working on the site. Groups like the Coalition of Immokalee Workers, Fair Labor Association, and others work to increase the visibility of farm worker rights within agriculture.

Sustainable Food in Higher Education

Higher education institutions buy $5 billion worth of food annually, providing a large purchasing power with which to influence change through their suppliers (Real Food Challenge, 2011). Sustainable food projects often include one or more of these elements: 1) procurement or menu innovations in the dining system, 2) academic courses or programs, 3) farmer's markets, community supported agriculture (CSA), or other direct-marketing programs, or 4) experiential learning in gardens or on farms (Barlett, 2011). Drivers for these programs vary from student led initiatives, administrative buy-in, or dining staff innovation (Barlett, 2011). Many colleges and universities have begun making commitments for sustainable food. Out of a recent sample, 47% of colleges and universities had purchasing goals and guidelines (Barlett, 2011).

One nationwide campaign to encourage and to provide resources to this transition is the Real Food Challenge (RFC). RFC is a grassroots organization that mobilizes students to ask their school to commit at least 20% of food purchases to be "real," defined as local, ecologically

sound, humane, and just. So far, eighteen schools across the United States have taken the pledge, some at higher percentages than 20% (Real Food Challenge, 2013). The research discussed in this report determines common definitions or goal-setting techniques used by higher education institutions to set sustainable procurement guidelines.

Sustainability and Sustainable Food at Duke

Duke University has engaged in reducing its environmental footprint for many years. President Richard Brodhead signed the American College and University President's Climate Commitment in June 2007, indicating that Duke would create a plan to achieve carbon neutrality (Sustainable Duke, 2009). As a result, he formed the Campus Sustainability Committee (CSC) in 2007, which created the Climate Action Plan (CAP)[1] (Sustainable Duke, 2009). In 2011, the University began expanding the CAP beyond greenhouse gases into a larger Sustainability Strategic Plan, outlining four key areas of goals and improvements: Emissions and Carbon Offsets, Infrastructure, Campus Operations, and Education and Engagement (Sustainable Duke, 2013). The Sustainability Strategy Planning process is ongoing, and Sustainable Duke added a Materials Management and Procurement section during the 2012-2013 school year.

Sustainable food on Duke's campus has been an area of interest for many years. Greg Andeck conducted an inventory of the environmental impacts of on-campus dining in 2004 (Hummel & Andeck, 2005). This inventory included an assessment of the transparency of food procurement, the amount of local and organic food purchasing, and the standards for seafood and coffee purchasing in the 23 on-campus dining facilities at that time. The assessment determined that in 2004, 1) eatery managers had little knowledge of from where their food comes; 2) only 3 out of the 23 eateries utilized local producers, and all of these were local bakeries; 3) only 1

[1] The CAP is a planning document that details how the college will achieve climate neutrality by 2024.

eatery regularly purchased organic food products; and 4) nearly every eatery served seafood products that were categorized as "avoid" on the Seafood Watch list[2] (Hummel & Andeck, 2005). This research led to implementing a University-wide requirement to use fair-trade, shade-grown coffee products, as well as to hiring a green dining and quality control position within Duke's Dining System (Hummel & Andeck, 2005). However, several eateries have changed contract owners since this research was conducted and the research has not been updated to determine new recommendations for sustainable food procurement.

Since Andeck and Hummel's assessment, several new food initiatives have started at Duke. In 2006, Duke Dining contracted Bon Appétit (BA) to provide service to several of the largest eateries on campus. BA has a corporate commitment to producing food that supports local farmers, healthy eating, humane treatment of animals, and sustainable seafood (Bon Appetite Management Company, 2013). In 2011, Kelly Jones, a Masters of Environmental Management (MEM) candidate, created a document on food and dining at Duke that tied together many different research projects and updated the information about dining services (Jones & Capps, 2011). This document detailed the following changes that had taken place: the Students for Sustainable Living created a Green Dining Award; faculty members implemented more academic classes focused on food issues; eateries installed pre-consumer composting; and community gardens and the Duke Campus Farm began producing food (Jones & Capps, 2011). Most recently, undergraduate students created an advocacy group called Food for Thought, which aims to integrate the Real Food Challenge into Duke's dining strategy. Hannah Colton conducted a baseline audit of Duke's "real" food purchases from four on-campus vendors in 2012. On average, these vendors had 24% of purchases as "real" food (Colton, 2013).

[2] Seafood Watch is a categorization created by Monterey Bay Aquarium to help consumers make educated decisions on which fish are sustainably harvested in their region.

Although these previous research projects have been able to provide baseline information on current dining practices on-campus, Duke has yet to develop definitions and goals around sustainable food procurement. Given that business models, procurement practices, and on-campus vendors change often, Duke needs consistent definitions and goals to ensure that sustainable food procurement is prioritized, transparent, and feasible. To aid in this process, Tavey Capps, the Environmental Sustainability Director of Duke, asked me to evaluate Duke's current sustainability efforts in dining, research how higher education institutions define and goal-set for "sustainable food," and create recommended goals that are appropriate for Duke's dining system and that meet the needs of the Campus Sustainability Committee.

Methods

My mixed-methods study borrowed from two research frameworks: formative evaluation and case study. Evaluation consists of six main steps: 1) focus the evaluation, 2) develop an evaluation plan, 3) develop data and collection tools, 4) collect data, 5) analyze data and interpret results, and 6) communicate and use evaluation results (Ernst, Monroe, & Simmons, 2009). Formative evaluations determine how well the current program is working to meet the desired outcomes and what should be improved in future iterations (Ernst, Monroe, & Simmons, 2009). Given that Duke has engaged in sustainable procurement in the past, this research aims to evaluate the success of that engagement. I used a SWOT analysis as the basis for my evaluation.

I also borrowed methods from collective case study research. Collective case study uses multiple cases from a class to determine a broader representation (Cousins, 2005). I interviewed staff, faculty, and/or students from five universities and used these as cases of how higher education institutions develop, maintain and educate students about sustainable food guidelines. In this research, the case boundary was a peer university or college (Cousins, 2005). Beyond the

five in-depth cases, I gathered additional material culture data from all of the peer institutions. This supplemented the detailed cases with a broader view of definitions of sustainable food from a larger number of institutions. The lessons learned from other schools' success and failure provided context and benchmarking for Duke's program.

In this section, I describe my methods of data collection and analysis in detail. Data collection included interviews, focus groups, and collection of material culture. My analysis focused on using NVivo 10 qualitative analysis software and the SWOT research framework.

Defining Peer Institutions

Duke is a member of the Consortium on Financing Higher Education (COFHE), a group of private elite schools that use a need-blind admissions process. Sustainable Duke often compares to a subset of the COFHE schools called the Ivy Plus[3] group, a coalition of high-ranking, research-oriented universities and colleges that work collaboratively on sustainability initiatives and share ideas. Given that the Ivy Plus schools are similar to Duke in academic rigor and are often leaders in sustainability initiatives, my client recommended that I focus on the Ivy Plus group of universities as my comparison schools. However, none of these schools are within Duke's geographic region in the Southeast. Therefore, I added Emory University, Vanderbilt University, and University of North Carolina at Chapel Hill to understand sustainable food opportunities specifically to the Southeast. This group of thirteen Ivy Plus schools and three southeastern schools constitutes my definition of Duke's peer institutions for the purpose of this study.

[3] Brown University, Columbia University, Cornell University, Dartmouth College, Georgetown University, Harvard University, Johns Hopkins University, Massachusetts Institute of Technology, Princeton University, Stanford University, University of Chicago, University of Pennsylvania and Yale University. See http://sustainability.yale.edu/people-partners/strategic-external-partnerships/ivy-plus.

Data Collection

Interviews

I used qualitative methods for collecting data through interviews, focus groups, and material culture. I conducted interviews with twelve Duke stakeholders and nine non-Duke stakeholders (Table 1). All interviews were conducted from October to December of 2013. The interviews were semi-structured and lasted approximately thirty to forty-five minutes. The list of general interview questions is in Appendix 1, and I asked additional questions based on the role and expertise of the subject. I recorded the meetings if the subject consented, and topically transcribed them after the interview. In a few cases, the subject did not agree to be recorded, and I took notes during the conversation to capture the data. I asked subjects if I could use their name is association with this research. However, several subjects did not consent for me to use their name; therefore, to protect the confidentiality of all of the subjects, I decided to use pseudonyms when discussing results. Given that titles are identifiable, I identified subjects by the school name and a number when directly quoting a subject. When discussing results more broadly, I use stakeholder type (i.e. dining staff, student, or sustainability staff) to provide more of the nuance from the research.

I used purposive sampling and snowball sampling to choose subjects to interview (Panacek & Thompson, 2007). Within Duke, I used purposive sampling, defined as "a process in which subjects are selected by the investigator to meet a specific purpose" (Panacek & Thompson, 2007). Tavey Capps and I determined interviewees of interest, and I sent emails to these stakeholders to ask them to participate in the study. All of these recruits agreed to be interviewed for the research. Outside of Duke, I started with purposive sampling as well. Tavey Capps provided me with the sustainability coordinator's contact information, and I emailed these contacts to ask for an interview. Five schools responded to my request (31%). Some of the

sustainability staff recommended that I speak with dining staff, faculty, or students who were more knowledgeable about sustainable food on campus. Using this snowball sample[4], I conducted interviews with various types of stakeholders at other schools (Table 1).

Table 1. Number of people who engaged in an interview or focus group for each school and stakeholder type.

	Stakeholders				
School	Sustainability Staff	Dining Staff	Faculty	Students	Other
Duke	**2**	**4**	**3**	**13**	**3**
Emory	1		1		
Johns Hopkins	1	1		1	
Harvard		1			
University of Chicago	1				
Yale	1	1			

Focus Groups

In addition to interviews, I conducted three focus groups with Duke Undergraduates, totaling 13 participants. Undergraduate students are the main constituency that Duke Dining aims to serve, and I wanted to research their beliefs about the strengths and weaknesses of the current sustainable food procurement system. The focus group interview guide is in Appendix 1. For two of the focus groups, I recruited from a Duke Campus Farm (DCF) work day. Members of the Alpha Phi Omega (APO) co-educational service fraternity accrue service hours by working on the DCF. During the work day, I asked the members if they would be willing to take a 30 minute break to answer questions about sustainability and Duke Dining. Seven of the student subjects were recruited using this method. The other focus group was with members of Food for Thought, a student organization that aims to promote sustainable food on campus through education and activism. Using a purposive technique, I reached out to the leaders of the Food for Thought

[4] Snowball sampling is defined as "a process by which the first subjects are drawn by convenience and these subjects then recruit people they know to participate…" (Panacek & Thompson, 2007).

group and asked to use a general body meeting as a focus group. Six of the student subjects were members of Food for Thought. In addition to these successful focus groups, I attempted to conduct focus groups with Duke University Dining Advisory Council (DUSDAC) and Duke Student Council members through the same methods of recruitment as Food for Thought. However, none of these students returned the recruitment emails to set up a meeting time.

Material Culture

Given the relatively low response rate of peer institutions to interview requests, I collected additional information on the peer universities through material culture. For each of the target peer institutions, I did web searches to find content on sustainable food and procurement at that school. I searched on university dining websites and sustainability websites to collect the data during September and October of 2013. I did the same searches for Duke and Duke Dining, and included some pertinent information from Duke's newspaper, The Chronicle. Previous students conducted research on food issues at Duke for a class called Food and Energy. I collected all of the final papers for that class and analyzed them for content on Duke Dining or food procurement. I also collected meeting minutes from the Campus Sustainability Committee (CSC) and Food Subcommittee on Duke's campus. Finally, I asked Duke Dining for relevant documents such as contracts and included them in the analysis.

Analysis

After collecting these data throughout the fall of 2013, I uploaded all of the documents and transcriptions to NVivo10, a qualitative analysis software. Using NVivo, I manually coded the documents into nodes, or themes. NVivo has some automated coding processes, so after manually coding, I conducted text search queries, reviewed the pulled data, and added any missing information into the nodes. From these nodes, I determined themes of the research as a basis for my recommendations to Duke Dining. I asked questions of my data through NVivo

queries. For example, to understand how peer institutions defined sustainability within several product categories, I used a matrix query to create a table of "Types of Products" and "Attributes of Sustainable Food." I conducted similar coding and matrix queries for all of my research questions.

I used NVivo to guide my Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. I asked Duke stakeholders questions about the strengths, weaknesses, opportunities and threats of Duke's sustainable food procurement, and coded the responses in NVivo to these nodes. Then, I pulled these nodes and looked for themes within each as the basis for my SWOT analysis.

Results

Duke Dining Business Model and Current Sustainability Strategy

Duke Dining has five core dining locations on campus that are managed by Bon Appétit Management Company (BA). BA is a food service corporation that emphasizes sustainability and healthy, fresh food. It has a program for local procurement, called Farm-to-Fork vendors, which defines local vendors as those within 150 miles of the dining facility that earn less than $5 million in annual revenue. It also has sustainable purchasing guidelines that require the purchase of cage-free eggs, certified "fair" Florida tomatoes, and Seafood Watch "best" or "good" choices for seafood. Finally, BA has corporate wide education and awareness frameworks such as Low Carbon Diet Day, where staff educate students about the carbon emissions associated with various food products. The education opportunities, customizability, and emphasis on fresh foods are key components of BA's corporate strategy (Bon Appetit, 2013).

At the five core, BA managed locations on Duke's campus, Duke Dining pays all expenses and reaps all of the revenues from sales. BA provides management expertise and programs

through its corporate structure and earns a fee from Duke Dining for this service. Union employees work at these locations. Because Duke Dining reaps the profit or loss from these locations, it has significant control over their operations. Until spring 2013, BA made all purchasing and menu decisions independently. During this time, student researchers used the Real Food Calculator framework to audit two BA managed locations, the Great Hall and the Marketplace, during April and October 2012. The students found that the Great Hall and the Marketplace had 23% and 25% "real" food, respectively, as defined by the Real Food Challenge (Colton, 2013).

More recently, Duke Dining switched to a partnership strategy where the BA chefs and Duke Dining staff collaboratively plan menus and determine food suppliers. In April 2013, Duke Dining canceled all purchasing from local vendors to undergo a request for information (RFI) process. According to three dining staff interviews, concerns about food waste and fair pricing were the main drivers for this process. By September 2013, Duke Dining gave BA permission to begin purchasing from selected local vendors again (2013 Oct 18, Interview with Duke Dining Staff 2). The aim with new purchases was to be more structured about weekly needs so that local vendors supply appropriate items in the appropriate scale (2013 Sept 27, Interview with Duke Dining Staff 1). When asked about local purchasing in the fall, one employee indicated,

> "It's all picked back up again, not as many as we started, but not because we won't be using them. It's to get ourselves grounded on what we're doing price wise, who we are using, who really is sustainable and who isn't." (2013 Oct 18, Interview with Dining Staff 2)

Within this new system of procurement, approximately 14.5% of Marketplace and Great Hall purchases were from Farm-to-Form vendors from July 2012 to June 2013 (2013 Sept 27, Interview with Duke Dining Staff 1).

No sustainability goals, guidelines, or metrics currently exist, but dining staff indicate that they are working towards creating standards for sustainability (2013 Nov 4, Interview with Duke Dining Staff 4). These standards are based on the following terms: local, organic, humanely raised, antibiotic and hormone free, and employee/worker rights. However, this same employee said that these are "aspirational" standards, not goals (2013 Nov 4, Interview with Duke Dining Staff 4). Generally, all of the dining staff with whom I spoke are wary of set goals, because of concerns that they will not have the resources or commitment to meet them. They also indicate that when sustainable products are cost-feasible, the team purchases them. One subject indicated that the partnership between BA and Duke Dining is strong; where it is financially viable, BA and Duke Dining tend to think about sustainability the same way (2013 Oct 18, Interview with Dining Staff 2). In a presentation from December 2013, Rick Johnson listed 62 BA Farm-to-Fork vendors from which Duke can purchase (Duke Dining, 2013). Another document listed thirteen Farm-to-Fork vendors from whom Duke purchases. U.S. Foods is the broadline food distributor for Duke University, and one dining staff member indicated an interest in working through US Foods rather than local distributors or farmers themselves as the best way to scale sustainable sourcing (2013 Nov 4, Interview with Duke Dining Staff 4).

Twenty-seven other on-campus vendors also exist, each with its own contract. At these locations, Duke Dining pays for all rent and utilities, and the vendor pays for all other operational expenses such as labor and food cost. The vendors pay Duke Dining a percentage of revenues to cover rent and utilities. For these contract vendors, Duke Dining asks that they incorporate sustainability into operations, but does not require it. The Performance Assessment of Culinary Excellence (PACE) program is the quality assurance audit, and each vendor is encouraged to increase "organic and local food purchasing where possible" through this

program. Food trucks and Merchant on Points provide twenty-three other options for students to eat with their meal plan dollars (2013 Dec 9, Campus Sustainability Committee Meeting Presentation).

When deciding which vendors to put on campus, student preference is a large component of the decision. Duke Dining works alongside DUSDAC and other stakeholders to find and vet the appropriate vendors (2013 Sept 27, Interview with Duke Dining Staff 1).

All of these options create significant variety from which students can choose, but also creates challenges for Duke Dining's business. Duke Dining receives 60% of revenues through meal plans, and 40% through Flex spending, cash or credit cards. It then distributes the money to vendors. While 100% of spending at core locations stays with Duke Dining, only about 20% of spending at non-core locations remains with the University. The most transactions occur at the following locations, in ranked order: Marketplace, Au Bon Pain, Pitchfork Provisions, Penn Pavilion, Panda Express, and Saladelia at the Perk. Within this list, only the Marketplace and Penn Pavilion are core locations (2013 Dec 9, Campus Sustainability Committee Meeting Presentation).

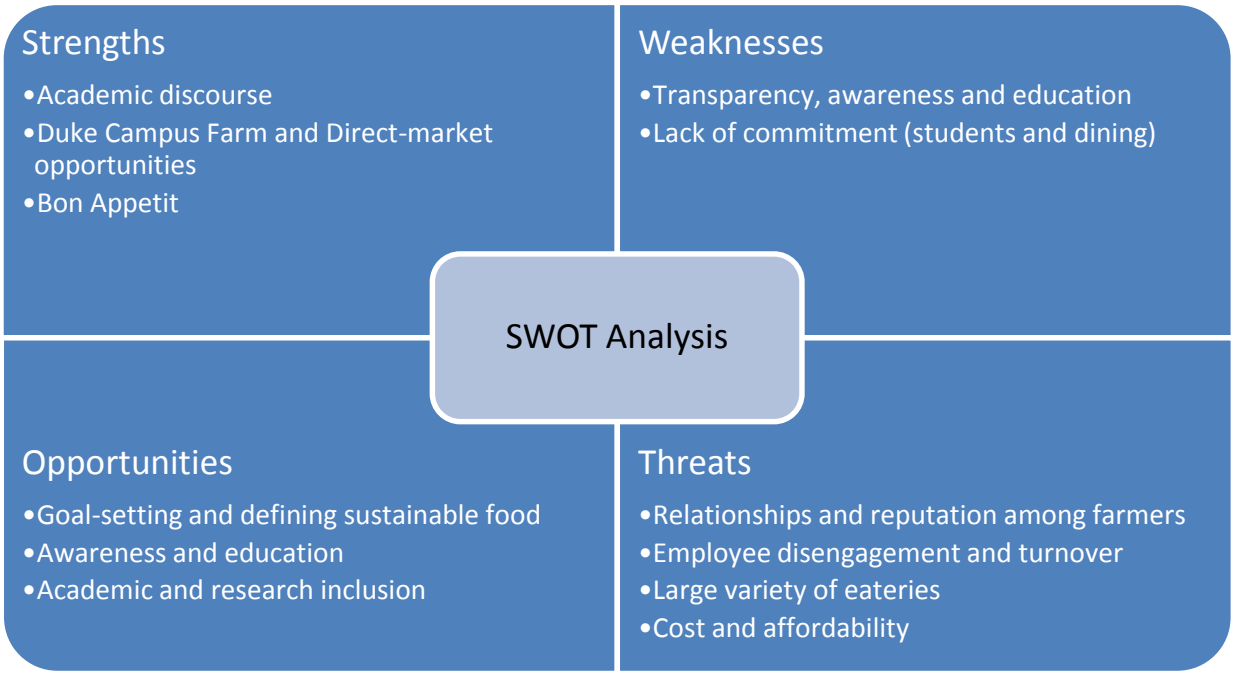
Duke Dining and BA staff indicate that sustainable food is a priority, but it is not a top priority at this time. Duke Dining Staff 3 acknowledged that Duke's efforts towards sustainable food have been a "swinging pendulum," indicating that cost concerns arose with increased sustainable procurement, so Dining has swung towards less sustainable procurement more recently (2013 Oct 21, Interview with Duke Dining Staff 3). All dining staff with whom I spoke were very concerned about cost and affordability. Major concerns are cost, food quality and variety, student experience, and meeting allergen and intolerance requirements. Duke Dining is also currently experiencing a challenge of renovating the West Union building. This required that

it transition to a new core BA managed location, the Penn Pavilion. Students have not embraced Penn Pavilion this school year, indicated in several Chronicle articles and the low sales. This is creating an immediate challenge for Duke Dining, as revenues from the Great Hall were significantly higher.

SWOT Analysis

I spoke with students, faculty and staff to determine the strengths, weaknesses, opportunities and threats of the current sustainable food procurement model (Figure 1).

Figure 1. SWOT Analysis of current sustainable food procurement for Duke Dining.



Strengths

When asked about the strengths of the program, stakeholders responded differently. Three subjects indicated that the academic discourse and discussion were strengths, citing examples such as the freshman required reading, *Eating Animals*, and the University course on food. One student said, "For my year, the summer reading book was about *Eating Animals*… really

different introduction to college life, and that book inspired us to think about what we eat. Huge inspiration" (2013 Oct 20, Focus Group with APO). A wellness staff member indicated that the biggest strength of the University course was eating together as a community during the discussion (2013 Dec 2, Interview with Duke Non-Dining 7).

Four Duke subjects cited the Duke Campus Farm (DCF) as a strength. Duke Dining was an important component in initiating the DCF. Several students stated an appreciation of serving DCF's produce in the dining halls, but they did not know if that initiative was ongoing (2013 Oct 20, Focus Group with APO; 2013 Nov 2, Focus group with Food for Thought). One staff member indicated that more students are taking advantage of the farm (2013 Oct 11, Interview with Duke Non-Dining 1). A DCF representative indicated during a Food Subcommittee meeting that one strength of the relationship with Duke Dining and DCF is the conversations they have about sourcing. At the beginning of this season, Duke Dining discussed what they wanted to procure from DCF, and they were able to come to an agreement together about what is feasible for both parties. This early season negotiation and planning was helpful to DCF in deciding what to grow (2013 Nov 18, Food Subcommittee Meeting Notes). Along with the farm, one faculty member appreciated the direct-market opportunities on campus, such as the Farmer's Market, DCF community-supported agriculture, and Walking Fish. Although Duke Dining does not sponsor these projects, they help raise awareness about local and sustainable food (2013 Oct 28, Interview with Duke Non-Dining 4).

The Food for Thought student focus group, one faculty subject and one staff subject indicated that Bon Appétit was a strength for sustainable food procurement. One student said,

> "…the fact that they have Bon Appétit is a strength. Bon Appétit's sustainability strengths… they have about 20% "real food" by the Real Food Calculator. That is a strong start since that is what the Real Food Challenge wants everyone to meet. We are

> ahead of the curve in the main dining, but there is definitely room for improvement" (2013 Nov 2, Focus Group with Food for Thought).

These students felt that having BA as the main vendor created good opportunities for sustainable procurement. One faculty member applauded Duke for retaining the Bon Appétit contract, saying, "I also hope that Duke will be able to continue to contract with Bon Appétit, unless someone comes along with a better track record, but from what I know Bon Appétit has the best track record" (2013 Oct 28, Interview with Duke Non-Dining 4).

Weaknesses

I also asked stakeholders about weaknesses within sustainable food procurement at Duke. Ten subjects indicated that lack of transparency and visibility about food procurement was a weakness. People desired more labeling within the dining halls, and generally were unaware of any sustainable procurement in dining. One student focus group indicated that after the RFI, they have not heard updates on whether Dining is repurchasing from local vendors (2013 Nov 2, Focus Group with Food for Thought). Another student said transparency is lacking around fair labor and fairly traded foods, with rarely any labels. Without labeling products, people indicated that they assume that the product is unsustainable (2013 Nov 2, Focus Group with Food for Thought). This lack of transparency creates a lack of awareness and a lost opportunity for education.

Another common theme among the weaknesses was a concern for lack of commitment from other stakeholders. The students with whom I spoke indicated that they did not know about or understand the commitment from Duke Dining around sustainable food, but believed that if given the choice, the students they know would prefer sustainable food. In one focus group, a student said, "Our generation likes to be socially active and they want to be sustainable and help the environment. If you give them an easy way to do that action, they will feel good and do it

again" (2013 Oct 20, Focus Group with APO). The students thought it could help with marketing specific eateries, if the quality of food was equivalent. A faculty member agrees with this, saying:

> "Many students are passive eaters on campus, they aren't willing to be rabble-rousers about food. But if presented an option, they might be willing to pay a slightly higher price. I see that in students who are willing to walk to the Refectory or Law Refectory, even when the food is often more expensive. Those eateries are very popular." (2013 Oct 28, Interview with Duke Non-Dining 4)

In contrast, Duke Dining staff indicated that they see a lack of commitment from students. One dining staff member said, "…the best thing we can do is work on the consumer to choose and demand healthier food. The mass market isn't, the small but vocal market is, but the mass market is pushing in the other direction." They believed that only a small minority of students care, and the majority indicate that sustainability is not a high priority.

Opportunities

In interviews, I asked, "What are future opportunities for improvements with the Duke Dining sustainable food procurement?" Limited number of themes emerged as highly coded areas within these opportunities. In this section, I present the themes that are mentioned by multiple subjects, or themes that are mentioned by one subject and align with the strengths or weaknesses sections.

Three stakeholders indicated that creating goals for a percentage of food dollars spent on sustainability should be a priority. One staff member summed up these comments, saying "I wish Duke would adopt it as its own [definition of sustainable food]. X miles means local, and X practices means sustainable, and that definition is really important. And a percentage is important. If we can be carbon neutral by 2024, surely we can be X% of local and sustainable food by a certain year" (2013 Oct 23, Interview with Duke Non-Dining 3). Beyond just the goals for the Bon Appétit run core locations, one student and one faculty member see an

opportunity in incorporating sustainability into the non-core locations as well (2013 Oct 20, Focus Group with APO, 2013 Oct 28; Interview with Duke Non-Dining 4).

Students who participated in the APO and Food for Thought focus groups emphasized the need for improved visibility and marketing around sustainable food as an opportunity. One student said, "Tell people about it. Bring more campus visibility… [Dining needs a] coherent, more comprehensive plan, and advertising it more coherently" (2013 Oct 20, Focus Group with APO). Another Food for Thought student agreed that stronger marketing is an opportunity, citing ways to improve:

> "I think [Duke Dining] should take the mindset of a marketing agency. You got to do Facebook, have to get the message out there 7 times. You know where [students] will be, eating in the Marketplace or Penn Pavilion. Do an aggressive labeling campaign with pretty new labels. Do events partnered with Frat or SLG, like a labeling discussion day…" (2013 Nov 2, Focus Group with Food for Thought).

As an institution of higher education, one stakeholder saw great opportunity for further academic alignment. One staff said, "At the end of the day, we are an institution of higher education, and everything we do should be connected to academic studies and be intentional. Why shouldn't food in dining hall have a connection to our studies?" (2013 Oct 23, Interview with Duke Non-Dining 3). This statement aligns with the three subjects who emphasized past academic strengths such as *Eating Animals* or the University course on food.

Threats

Several themes emerged as threats to Duke Dining's sustainable food procurement. First, three non-student, non-dining stakeholders were concerned that local farmers and distributors had lost respect and trust in Duke as a customer. One stakeholder said,

> "In terms of actually having Duke as a customer, there is a lot of concern, because there has been vacillation, a perceived lack of commitment to local procurement, there's been difficulty getting consistent orders placed, there's been a lot of pushback with what is seasonally available" (2013 Nov 5, Duke Non-Dining 5)

These stakeholders are concerned that the RFI may have harmed Duke's reputation because Duke pulled out of local purchasing agreements with little warning and has been slow to reengage with suppliers.

Another threat is employee disengagement and turn-over. The two dining staff interviewees from Harvard and Yale both indicated that franchising the employees can be a strength in their programs (2013 Oct 4, Interview with Yale 1; 2013 Oct 31, Interview with Harvard 1). One Duke Dining employee said that it attempts to engage employees by doing farm tours or other education, but said that employee interest is low (2013 Nov 4, Duke Dining Staff 4). Another employee problem is high turn-over in management. High levels of turn-over in management means a loss of continuity, supplier frustration from consistently dealing with new management, and loss of efficiency. Turn-over hurts the ability to build long-term relationships with both suppliers and employees to build trust and mutual understanding (2013 Oct 23, Duke Non-Dining 3).

The next threat is the large variety of eateries. Other universities I spoke with or analyzed do not have as many contracts to manage in the Duke Dining system. Having multiple eateries creates additional complication, as the sustainable purchasing guidelines could apply to only Duke Dining core locations, or they could apply to both core locations and all contract vendors. Contract vendors range from local restaurants, such as Saladelia and Pitchfork Provisions, and large corporate entities such as McDonald's, Au Bon Pain, and Panda Express. Smaller, local entities have significant autonomy to make sustainable choices, but may not have the time or financial resources to invest. In contrast, large corporations have set menus and suppliers and do not have the ability to flexibly adapt menus to meet sustainability guidelines. Four subjects indicated that the variety of eateries creates complication around how to incorporate the non-core

locations in the purchasing guidelines. One faculty member suggested that as vendor contracts come up for renewal, Duke Dining should include in the RFP that sustainability is a high priority, and remove vendors from campus who cannot comply (2013 Oct 28, Interview with Duke Non-Dining 4).

The final threat is cost and affordability. Duke Dining has seen cost increases in the past due to sustainability, and it is currently concerned with affordable college education (2013 Oct 21, Interview with Duke Dining Staff 3). All five of the Duke Dining employees I interviewed mentioned cost as a key threat to sustainable food at Duke.

Lessons from Other Schools

From my interviews with five peer institutions and material culture analysis from eleven others, I determined best practices and lessons that are relevant to Duke as we create sustainable food definitions and goals. The definition of local can vary widely between organizations. A Farm-to-College survey in 2007 indicated that about half of colleges chose a 50-200 mile radius as the local definition, while 20% choose their state and 10% choose their region (Emory University, 2013). My research yielded similar results, summarized in Table 2. Seventy-five percent of researched schools have a definition of local and/or regional. About 50% of the schools have definitions of 200 miles or less, 19% use their state as a definition or as an add-on to the mileage definition, and only one school uses exclusively a regional definition.

Table 2. Definitions of Local and Regional by school.

School or Organization	Definition of Local (miles)	Definition of Regional (miles)
Brown	100-200	
Columbia	150	
Cornell	100, or within NY	100-250
Dartmouth	none	
Emory	Within Georgia	
Georgetown	none	
Harvard	250	
Johns Hopkins	200	
MIT	none	
Princeton	250	
Stanford	150	250
UNC Chapel Hill	150, or within NC	250
University of Chicago	150-250	
University of Pennsylvania	150	
Vanderbilt	none	
Yale	none	350
Bon Appétit	150	

I analyzed the data to determine which terms were most often included in sustainable food materials and interviews from peer institutions. Of the 17 schools I researched, including Duke, 94% had content coded to local, 76% had content coded to organic, and 65% had content coded to either regional or health. This indicates that peer institutions consider these traits more frequently than they consider other sustainability attributes (Table 3).

Many attributes are more product specific than others. Table 4 indicates what attributes are most commonly associated with common product categories on a college or university campus. Sustainability goals or communication around coffee are most likely to use Fair Trade Certification, and eggs generally use cage-free or humane as a metric of sustainability. While

each product category has specific sustainability concerns or characteristics that appear more often, many of the categories have local and/or organic as a key characteristic.

Table 3. Percentage of Peer Institutions that have content coded to specific sustainable food attributes.

Attributes	Percent of Peer Institutions that had Content coded to that attribute
Local	94%
Organic	77%
Health	65%
Regional	65%
Fair Trade	65%
Humane	53%
Relationship with Producer	53%
Vegetarian/Vegan	53%
Certifications	47%
Improved Economy	47%
GHG and Climate	41%
Hormones and Antibiotics	41%
Farm Workers Rights	41%

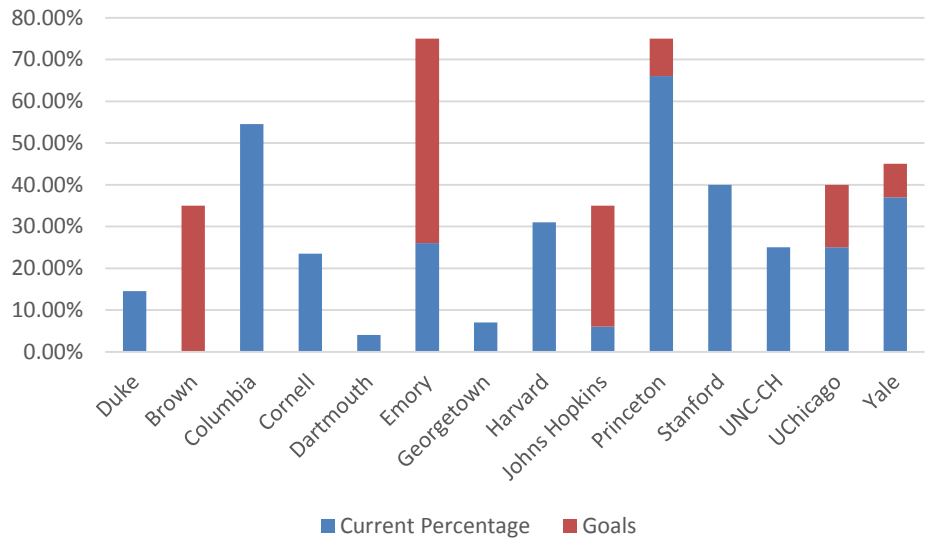
Table 4. Most frequently coded sustainability attributes per product type.

Product Category	Attribute (ranked order)
Coffee	Fair Trade
Eggs	Cage Free/Humane
Grocery	Organic Local
Beef	Grass-fed/Pasture-raised Local
Chicken/Poultry	Organic Local
Pork	Grass-fed/Pasture-raised Local
Milk/dairy	Local Hormones/Antibiotics Organic
Produce	Pesticides and Chemicals Organic Local
Seafood	Seafood Watch

I determined how Duke's current local or sustainable food purchasing percentage compared to the peer institutions from this research (Figure 2). The red line shows Duke's current local or sustainable purchasing percentage. Over 55% of the peer institutions (9 schools) have current percentages greater than Duke's, and 38% of the researched institutions have set a goal or target for sustainable food procurement. Most of these peer institutions that have goals are using 35-45% as the target for sustainable food. Princeton and Emory have significantly higher goals. Princeton current sources 58% of food within 250 miles, and 9% of food is "non-local and sustainable," making it very close to reaching the 75% local or sustainable goal by 2015. Emory

also has a 75% sustainable food goal, but is less close to meeting the target. Although this chart aims to benchmark Duke across other schools, different institutions use unique definitions that make these numbers difficult to compare.

Figure 2. Current Percentages and Goals for local or sustainable food at each institution.



Process of Developing Sustainable Food Guidelines or Goals

The Food Alliance lists ten key steps in creating a sustainable food sourcing strategy, listed in Table 5 (Food Alliance, 2013). The five schools I interviewed had gone through one or more of these steps. I asked them about the impetus for sustainable food purchasing at their school, key components of their success, and advice that might be helpful for Duke. The most frequently discussed words were determined using a Word Frequency query in NVivo from these portions of the conversation (Figure 3). Many of the words emphasized stakeholder engagement or community involvement, such as "goal," "group," "committee," "communicate," "help," "priorities," and "commitment."

Table 5. Steps to create a sustainable food sourcing policy. Adapted from (Food Alliance, 2013).

Steps	**Key Components of this step**
Set the stage for success	Engage with stakeholders at all levels and identify sustainability champions and allies.
Identify the parties and nature of the effort	Formalize the interests and role of this group of stakeholders.
Establish a vision	Establish a broad vision statement for the university's sustainable food procurement.
Anticipate challenges, identify and prioritize opportunities	Identify constraints and barriers, and prioritize opportunities with these barriers in mind.
Identify strategies, standards, and compliance mechanisms	Identify common definitions and set standards for what types of products the organization prefers.
Establish a baseline	Collect data on how much food you are currently procuring within these standards.
Set goals	Determine a percentage goal and set a timeline for achieving that goal.
Create an action plan	Determine who is expected to carry out these goals, and what partners are needed to do so effectively.
Create an evaluation plan	Determine how you will evaluate progress towards the goal
Communicate	Communicate your efforts and accomplishments to the stakeholders.

Figure 3. Word frequency map of other school's interviews about the process of creating goals and definitions.

This section provides a brief report of how each interviewed school determined the sustainable food purchasing guidelines. Some schools, such as Johns Hopkins, Emory, and Yale,

had multiple interviewees, providing stronger data and more insights into the guidelines. Harvard and University of Chicago each only had one interview, providing less detail for that section.

Emory: Emory University began the process of discussing food priorities due to a new Presidential administration's strategic vision. The new president commissioned a committee to create definitions, prioritize sustainability actions, and facilitate tracking and verification within sustainable food. This committee consisted of faculty, staff, dining staff, and students, and it decided on a goal to source 75% of food from local or sustainable sources. The committee continued to meet regularly and often revisits the definitions and targets to ensure that they reflect the most applicable information. This iterative process and flexibility is crucial for having an adaptive plan (2013 Oct 22, Interview with Emory 1). Both interviewees at Emory indicated that bringing together stakeholders from across campus was an important component of their success. These Emory stakeholders believe that an aspirational goal is appropriate and believe the committee will achieve success even if they do not met 75% by the deadline. Initially, verification and tracking was difficult for Emory, as someone at Sodexo, the contract food service provider, manually inputted the invoices into a spreadsheet. This year, they hired a consultancy, ECOVA, to implement a recordkeeping tool. With this tool, they hope that the time-consumption from tracking will decrease (2013 Dec 4, Interview with Emory 2).

Johns Hopkins University: JHU's President signed the Real Food Challenge in the fall of 2013. The three JHU interviewees indicated that cooperation between students and administrators as well as a concern about the past negative reputation of JHU Dining were the key drivers for signing. JHU's Dining system had a bad reputation around food at the same time that sustainable

food was getting more attention. This created a policy window for students and sustainability staff to show how sustainable food provides a platform for higher quality food and a better reputation (2013 Dec 3, Interview with JHU 2). Students campaigned to increase awareness about food issues for many years, but the service provider at the time, Aramark, was unwilling to share invoices and baseline purchasing. Once Aramark's contract was up for renewal, students requested that JHU bring on Bon Appétit instead, given the company's commitment to sustainable food. JHU agreed, and following this contract shift, students worked to propose signing the RFC with support from the Dining Director and the Dean of Housing and Residential Life (2013 Dec 3, Interview with JHU 1). Key components to the success were finding a diverse set of allies for sustainable food. A student organizer said,

> "Food is connected to so many issues, not just environmental sustainability. You can bring in economist who care about supporting local economy, you can bring in social justice students who care about workers' rights and union employees, you can bring in the health side, like public health or future doctors interested in antibiotic resistance…" (2013 Dec 3, Interview with JHU 1)

Students conducted the baseline calculation last year, and after signing the commitment, JHU will now create the specific action plan to get to 35% "real" food. A committee of staff, faculty, and students will create the action plan this spring and next year (2013 Dec 6, Interview with JHU 3).

Harvard: Harvard Dining is creating goals with sustainability and health in mind based on the Office of Sustainability's request. They brought together dining staff in many different roles, faculty and researchers to create the goals, and they are currently documenting baseline performance towards these standards (2013 Oct 31, Interview with Harvard 1). Because Harvard

did not have published goals by December 2013 when these data were collected, additional information about how they set the goals or verified progress were not available.

University of Chicago: The University of Chicago created their goals with significant top-down pressure and minimal collaboration. The food service provider, Aramark, was due to renew the contract with the school, and the Dean of Campus life determined that sustainability should be a priority in the RFP process. She asked all vendors to provide plans to source 40% local food to the school as part of the decision-making process, and 40% local sourcing remains the institutional sustainable food goal. During spring of 2013, researchers at the university collaborated to create an algorithm to how much different sources had an impact on the key priorities of the school. The metrics are part of a continuous improvement process and aid the school in prioritizing and tracking sustainable purchasing (2013 Nov 1, Interview with UChicago 1).

Yale: Yale University is a self-operated system, and the schools specifically sought out a Dining Director with a strong background in sustainable food purchasing (2013 Oct 10, Interview with Yale 2). This Dining Director worked alongside the Yale Sustainable Food Project to create purchasing guidelines. Yale Dining is solely responsible for procurement and menu planning that meets these sustainability guidelines (2013 Oct 4, Interview with Yale 1).

These five case studies have several overlapping themes. First, a wide range of stakeholders can initiate the sustainable food purchasing process. At Emory, faculty led the initiatives; students pushed for change at JHU; and the Dean of Campus Life made the sourcing policy at

University of Chicago. This indicates that successful programs exist whether the students, faculty, or staff initiated the program. New presidents, dining directors, or contract vendors can also be impetus for sustainability change. At Emory, a new president commissioned a committee to begin conversations around goals and standards for Emory. At JHU, the RFP for a new contractor sparked additional interest in sustainability. At Yale, they sought out the sustainability expertise in the current Dining Director, and he has steered the vision for the university. The administrative changes can be moments for reflection and improved commitment to sustainability.

The second theme is stakeholder engagement. All of the schools except University of Chicago used committees to determine standards and goals. Typically, members of these committees included dining directors, chefs, other dining employees, contract vendors, sustainability staff, faculty experts or other researchers, and students. Interviewees at John's Hopkins, Emory, and Harvard indicated that the committee's ability to bring stakeholders together was a strength of the sustainable food program. A subject from JHU indicated that the committee was important in sustaining a commitment and acquiring the necessary resources for change. He said, "It is a community goal, it's not just a dining goal" (2013 Dec 6, Interview with JHU 3). Part of stakeholder engagement is transparency and visibility into the Dining system and what is currently being purchased. This creates trust and a collaborative environment rather than an antagonistic relationship between dining staff, contract vendors, and sustainability advocates.

Partnership with researchers or external partners can also be an important process in creating standards. Although University of Chicago did not engage a committee for the goal-setting process, it incorporated external views in the priority-setting algorithm, which was developed by

researchers at the institution. At Harvard, a research institution conducted free research on sustainable seafood sourcing for dining services. At JHU, students often engage with sustainable food internships through the Center for a Livable Future, which sparks student's interest in tangible improvements in food on campus. JHU will also include local food hubs, distributors, and perhaps farmers in developing the action plan for meeting the Real Food Calculator.

The final theme is flexibility in implementation. Yale, Emory, and University of Chicago all have processes to allow for flexibility within the sustainable food guidelines. Emory has an iterative review process of the sustainable characteristic priorities within each product type every few years with the committee. For them, the iterative process is important because they started out optimistic about the Food Alliance sustainability certification. However, this certification is less prevalent than they had hoped, requiring them to change short-term priorities (2013 Oct 22, Interview with Emory 1). UChicago also has flexibility through the developed algorithm. This algorithm weighs attributes in five categories: cost/return, greenhouse gases, local economic development, proximate neighborhood engagement, and health impacts. These metrics become scores based on the product characteristics, and it helps dining services decide in a transparent way what is worthwhile to procure (Cao, et al., 2013). This gives flexibility to consider five categories rather than just one, such as local or organic. Yale also has a system for flexibility. The Dining Director is trusted to understand the markets, the needs of the institutions, and the sustainability of various products and make decisions flexibly given the circumstances (2013 Oct 4, Interview with Yale 1).

Health

Four out of the five Duke Dining interviewees mentioned that providing healthy options is a top priority within Dining. Other Duke stakeholders also see health as an important component of the sustainability of the food. One faculty indicated, "For food to be sustainable for humans,

needs to be a part of wellness, rather than something that contributes to development of disease and illness" (2013 Nov 5, Interview with Duke Non-Dining 5). Another agreed, saying "[T]here is a health and nutritional dimension to sustainable food as well that includes the characteristics of food that support health or not…Some foods are appropriate components of a healthy sustainable diet and others are less so" (2013 Oct 17, Interview with Duke Non-Dining 2).

About 65% of the schools I investigated included health concepts in their materials on sustainable food. The most referenced words within health are in Figure 4. Words like antibiotics, hormone, rGBH, and humane (included as part of human) indicate that animal production is a large portion of stakeholders consideration about health. Words like fertilizer, pesticides, production, and organic indicate a concern about produce production as well. Finally, consumer facing words such as fats, synthetic, processed, carcinogenic/cancer, and nutrients indicate a concern about the health impacts on the consumer. These words indicate that these peer institutions consider meat production, produce production and/or the nutritional value of the final food product as components of "healthy" food.

Figure 4. Word frequency map indicating the words used when discussing health and sustainability.

During interviews, at least one subject from each of the five institutions indicated that health and wellness was a top priority in sustainability. Emory's Sustainability Office uses the tagline "Healthy Emory, Healthy Planet" to describe its initiatives (2013 Dec 4, Interview with Emory 2). Harvard's Office of Sustainability is encouraging Harvard Dining to include wellness in its sustainability goals (2013 Oct 31, Interview with Harvard 1). The John's Hopkins Sustainability Office also emphasizes health and wellness to get addition public-health focused stakeholders to talk about sustainability issues (2013 Dec 3, Interview with JHU 2). This view of health as an important aspect of sustainability was critical to bringing diverse stakeholders into sustainability conversations (2013 Dec 3, Interview with JHU 2).

Within the universities' goals, the most often coded health-based themes included reducing or eliminating MSG, trans fats, additives and preservatives, and/or high fructose corn syrup. Other commonly coded attributes for healthy foods were within the meat and dairy categories, such as grass-fed or pasture-raised or hormone and antibiotic free. The most commonly coded node for healthy produce was produced without the use of synthetic pesticides and fertilizers. The University of Chicago had a rubric to determine the health of a product based on antibiotic, hormone, fertilizer, and pesticide use (Cao, et al., 2013).

- Antibiotic use: scored 0 if used in subtherapeutic doses, and 1 if used for therapeutic purposes only
- Hormone use: scored 0 if uses growth hormone, and 1 if the farmer does not.
- Pesticide use: scored 0 if uses synthetic pesticides with known carcinogenic properties; scored 1 is uses synthetic pesticides without carcinogenic properties; scored 2 if uses integrated pest management, and scored 3 if uses no synthetic pesticides.
- Fertilizer use: scored 0 if uses "inorganic fertilizer that have been found to easily contaminate food/water; scored 1 is uses inorganic fertilizers with less toxicity; scored 2 if uses organic fertilizers, and scored 3 if uses safer organic fertilizers.

This method compares the health impact of a particular food product to the other four factors of interest for UChicago.

Cost

All of the Duke Dining staff I interviewed mentioned cost as the main challenge for sustainable food procurement. During interviews with other schools, I asked about cost to determine whether they were facing the same barriers. When asked about cost, the Yale Dining Director said,

> "Of course, if you look at sustainable sourcing, you see some products cost more money. Does that mean that you need more money or need to get more resources toward purchasing? That is a shortsighted view if just look at it from that perspective… [Instead, ask] where are there opportunities for optimization and efficiencies so you can release some resources already in the system. Make [it] more efficient, then allocate [the money savings] to where you need more resources." (2013 Oct 4, Interview with Yale 1)

He goes on to explain that Yale increases operational efficiency through reduction in pre-consumer and post-consumer waste, labor optimization, and energy savings, and then can invest the additional resources into procurement. He also indicated that cost savings through decreasing variety can help provide more resources to sustainable procurement, saying,

> "…a lot of people think that students want a lot of variety. I have found that whenever students are asking for more variety, it's because their needs aren't met. But if what you have is good enough, then you don't need as much variety" (2013 Oct 4, Interview with Yale 1).

Yale is also working on improving sustainability by creating innovative new menu items. The Dining Director and Sustainability Director both indicated that this was a key to the success (2013 Oct 4, Interview with Yale 1; 2013 Oct 10, Interview with Yale 2). The Dining Director indicated that he is working with chefs to focus more on plant-based proteins rather than animal-proteins. For example, meatballs at Yale use 30-40% mushroom in the process, and the Dining Director mentioned that it increases the flavor and quality of the product while decreasing beef, which is both more expensive and less sustainable (2013 Oct 4, Interview with Yale 1). These innovations and operational efficiencies aim to mitigate cost increases for Yale's dining service.

JHU is committed to not raising meal plans above a certain threshold, but they have recently committed to a goal of 35% "real" food by 2020 (2013 Dec 3, Interview with JHU 1). Therefore, they will not be able to increase costs and are considering purchasing cheaper cuts of meat, decreasing portion sizes, and increasing the importance of Meatless Mondays (2013 Dec 3, Interview with JHU 1 and 2). The JHU dining director is not concerned about the costs of food purchasing, but believes that the larger cost increase will occur with the need to increase infrastructure for processing the food. He says:

> "Initially, the changes won't cost more—we'll be able to switch vendors or get a different kind of tofu and it won't cost anything—easy and cheaper part. The harder part will be the more expensive things, or trying to find suppliers and producers that don't exist… So our costs won't necessarily be food, but building on additional kitchen space so we can purchase strawberries in the peak season at a cheaper cost, and then process them to be able to use them in the winter months. Whether that is making into a jam, or freezing, prepping, storing so we can have strawberries on waffles in the winter. That is the best way to control our spending costs, and having a surplus. That will be the more expensive part than the food" (2013 Dec 6, Interview with JHU 3).

One Emory sustainability faculty similarly believes that schools can do a lot without increases in cost, such as reductions in variety or meat portion sizes (2013 Oct 22, Interview with Emory 1).

One subject from Harvard sees internal research and collaboration as a way to increase sustainable food without increasing costs (2013 Oct 31, Interview with Harvard 1). Harvard Dining Services partnered with a research institute on campus, the Center for Health and Global Environment, to determine a sustainable seafood strategy. This research institution looked at purchases and operational challenges, determined the least sustainable seafood sources, and developed cost-neutral alternatives for the dining service. This partnership was good for both institutions—Harvard Dining was able to get free and relevant research, while the research institute could tackle a real world problem that interested students (2013 Oct 31, Interview with Harvard 1).

Within University of Chicago's sustainable sourcing algorithm, the cost and return category "measures the financial costs and returns to the University when purchasing from the food source" (Cao, et al., 2013). The categories are:

- Net cost or return, which is the difference between the total costs of procuring that good minus the current cost.
- Individual cost or return for each food source, product costs only, which indicates how the cost of a single product from a specific supplier compares to the USDA average costs.
- Individual cost or return for each food source, transportation costs only, which uses IBM's transportation cost formula to determine shipping cost per unit.[5]

The scores associated with cost/return are included in the broader scoring of a new supplier or product in the other four categories. The algorithm determines when the cost is worthwhile because of the other benefits, and when the money can be used for other purposes to better meet the goals of the university.

Recommendations

Given the large impact of food, universities have created goals to reduce the environmental and social footprint of their food dollars. Duke began this process about a decade ago, but has never set standards or goals around sustainable sourcing. I began my research with a SWOT analysis of Duke Dining's current sustainable food sourcing. In this evaluation, stakeholders often were skeptical of Duke Dining's sustainable sourcing due to a recent lack of commitment to local food, or did not know about how Duke Dining was making sourcing decisions. The main complaint and concern was transparency and awareness of a sustainable sourcing strategy. From this research, setting standards and a goal around sustainable procurement is an important next step in increasing visibility and transparency. This research found that over 55% of peer institutions have current sustainable food percentages higher than Duke's, indicating that Duke appears to have a lower current commitment level than other institutions in the Ivy Plus group.

[5] Shipping cost per unit= (Per Mile Cost*Distance*Unit Weight)/(Utilization*Truck Capacity)

Given this research, I recommend that Duke Dining and Sustainable Duke continue to work together to create sustainable food standards for Duke University. In developing these standards and goals, I recommend the following best practices. Duke Dining and Sustainable Duke should:

1) Collaborate with a wide range of stakeholder in developing definitions and targets. Schools I interviewed had committees that met regularly to determine and re-evaluate sustainable sourcing initiatives. These committees discussed definitions, prioritized based on each school's geographic location and mission, and managed tracking and verification of the system. Sustainable Duke has started a Food Subcommittee of the Campus Sustainability Committee during the 2013-2014 school year to fill this purpose, and this is a good platform for continued conversations. Duke Dining should evaluate whether additional stakeholders, such as DUSDAC or DSG, Bon Appétit, local distributors or farmers, and retail contractors should be present at meetings to provide additional insight. In addition, food is connected to many non-environmental issues, and Sustainable Duke should engage with non-environmental faculty, staff and students to discuss these goals. Public health professionals, economists, or social justice advocates can all be interested in food and should all be engaged in the discussion to build more consensus that goals and standards are important (2013 Dec 3, Interview with JHU 1).

2) Consider the priorities and strategic geography of Duke when making the goals. Sustainability typically considers three elements: social, environmental and economic impact. This broad definition beyond just environment provides opportunity for Duke to consider a suite of characteristics, such as health, affordability, or investment in the local economy, as part of the sustainability plan. Given the current concern over student experience and community while eating, perhaps sustainable food includes a component about the "sit and stick" dining

experience. Sustainable sourcing can also meet broader missions of the university. Sustainable sourcing may create opportunities for interdisciplinary thinking and student and faculty research. Investing in the local community with food dollars may improve "gown-town relationship" with Durham, and engage Duke in the Durham-wide conversation around sustainable food. These additional sustainability metrics are helpful in getting more buy-in from administrators and embedding sustainability into organizational goals.

3) Improve labeling, marketing, and communication around sustainable food for the purpose of transparency and student education. The main weakness of the current program is lack of transparency. Duke Dining should engage with Sustainable Duke and the resources of Bon Appétit to create marketing strategies for the sustainable food procurement policy. It should also create exciting labels that accompany all produce or meat that is sustainable. This will help make employees more engaged with the food they make and students will become excited about the food they purchase. All of this must coincide with high food quality for sustainable food, as students are willing to pay more if it is a product they enjoy.

4) Engage with students and faculty to incorporate sustainable food into coursework and improve food literacy. A sustainable sourcing policy works best when students desire to learn about these issues. The academic discourse from *Eating Animals* and the University food course were strengths of the sustainable food program in the past, and Sustainable Duke and Duke Dining should work to incorporate academic elements into the sourcing strategy. Duke currently has many sustainability courses and several food related courses that discuss topics of sustainability. These courses can engage with dining employees to increase excitement about sustainable food, help create labels for dining services, and engage other students in conversations. Duke Dining should also be involved in creating the Sustainable Food Systems

graduate certificate, as they can provide valuable real-world experience to graduate students interested in food. Finally, faculty from the Food Research Working Group can get involved in relevant research for Duke Dining, providing valuable expertise a low cost and the opportunity for interdisciplinary action. By incorporating an academic conversation into the sourcing strategy, students will be more educated about food issues and may be more willing to accept the necessary changes to Duke's food system to become more sustainable.

6) Be innovative to mitigate cost increases. Duke Dining has indicated that students complain about the cost of food, and it does not want to increase costs through sustainable procurement. However, other schools manage costs and continue to improve in sustainable sourcing by reducing portion sizes, especially at all-you-care-to-eat facilities; increasing vegetarian meals, which are both cheaper to make and less costly on the environment; or incorporating more vegetables into the meat products like meatloaf or meatballs. Increasing Meatless Monday campaigns across campus, where the default choices are meatless and students can choose to add meat, may also increase vegetarian eating and reduce costs. Duke Dining can also manage costs through prioritization. It could focus sustainable purchasing on the most often purchased goods, to be able to order in large quantities or a variety of cuts of meat to create a discount. It could also prioritize organic purchasing for the "Dirty Dozen," a list of produce from the Environmental Working Group that provides the biggest health advantage from purchasing organic (Environmental Working Group, 2013).

7) Improve relationships with local growers. The RFI may have created strained relationships with some local vendors, and they may be wary to trust Duke with purchasing again. Therefore, Duke Dining should make an effort to create true partnership with local growers and distributors. Duke Dining could meet with growers and distributors and discuss

opportunities to mutually beneficial purchasing. For meat producers, purchasing the less desirable cuts of meat will keep costs low for Duke while providing meat producers with a certain sale for these cuts. For produce growers, Duke Dining can meet to discuss with the growers to discuss both parties' specific needs and challenges and collaboratively create a seasonal plan for farm production that meets both Duke and the grower's goals. This model worked well with the Duke Campus Farm and can be used for other local vendors as well. Duke Dining should understand that these producers have unique circumstances that make them distinct from conventional distributors, and should aim to listen to these concerns and create mutual value. By creating true partnerships and helping local growers thrive, Duke Dining can create more value in the system, hopefully drawing farmers to keep farming and provide more local food, driving down costs.

8) Re-distribute staff time and hire student employees. With a sustainable food purchasing policy comes significant need for time resources. Harvard and Emory had a full-time staff member whose job is to implement programs, find sustainable suppliers, and track progress. This would be the ideal solution for Duke as well. However, if the budget does not allow for a new hire, Duke Dining can utilize time from other staff to implement the plan. Tammy Hope, the Quality Assurance Manager, does not currently have additional time in her schedule to think about or implement new sustainability strategies. However, she could use a student intern to do some of the more straightforward components of the PACE program, and re-allocate that time to meeting with suppliers and developing relationships. For marketing, Kristen Marinko can allocate more of her marketing time to sustainability, working alongside BA to put on events and create food labels. Sustainable Duke can also help with marketing and social media aspects of this campaign through the Outreach Coordinator. Finally, Duke student interns can work part-

time to track and verify the progress towards these goals. Bon Appétit's current program for Farm to Fork vendors will do significant amounts of verification and tracking, and student interns can fill in the remaining gaps. Bon Appétit will likely be able to provide additional resources to the initiative given their expertise in sustainable sourcing. A strong partnership and trust between BA and Duke Dining would allow Bon Appétit to use their expertise in sourcing without Duke Dining's need for significant oversight.

Recommended standards and definitions

Based on my research, I determined the following definitions and standards for Duke Dining to consider. These have been a part of a stakeholder engagement strategy with the Campus Sustainability Committee (CSC) and Food Subcommittee throughout the year, and the CSC should continue to work on these goals alongside Duke Dining in a collaborative group.

The peer institutions from this study most often choose a 35-40% goal for sustainable procurement, and I recommend that Duke employ the same goal in the long-term. Each school defines sustainable food differently; JHU uses the RFC definitions and metrics; Yale emphasizes regional products, integrated pest management, and healthy components; Emory has a prioritization for each product category (Appendix 2). I determined six priority products for Duke Dining when making purchasing policies based on thematic nodes from my research: chicken and eggs, beef and pork, dairy, seafood, produce, and coffee. Drawing from the research findings summarized in Table 3 and most heavily from Emory and Yale's purchasing policy, I prioritized characteristics within each product type. The large side bar is the mandatory criterion, often based on health. Then I included level 1, level 2, and level 3 criteria that can add-on to the mandatory criterion. Within this framework, the food can be considered "sustainable" if it meets any one of the four criterion. In the future, Duke could decide on a percentage it would like to

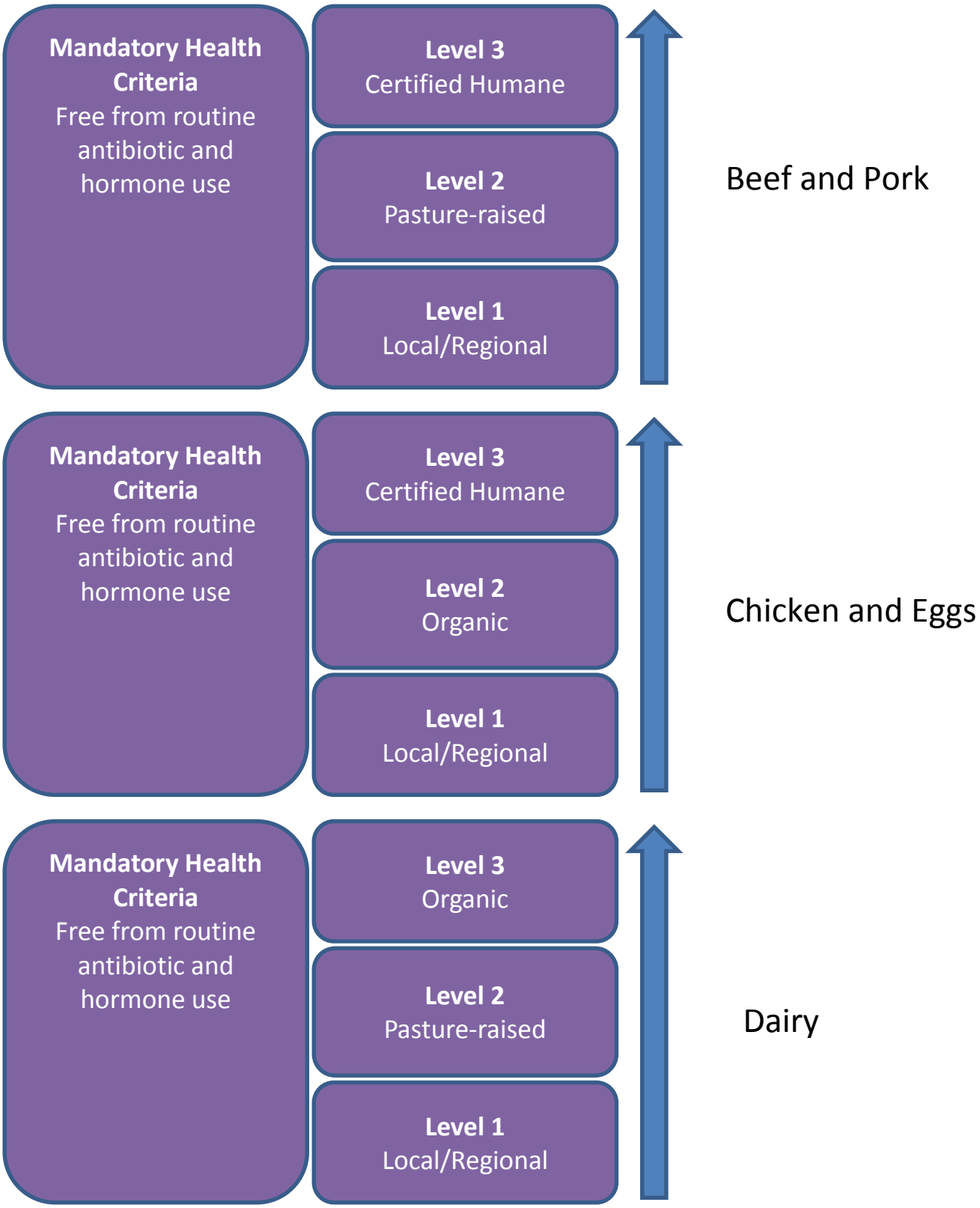
meet at each level, or use the framework in a way that is most marketable. Within this, I recommend the following definitions:

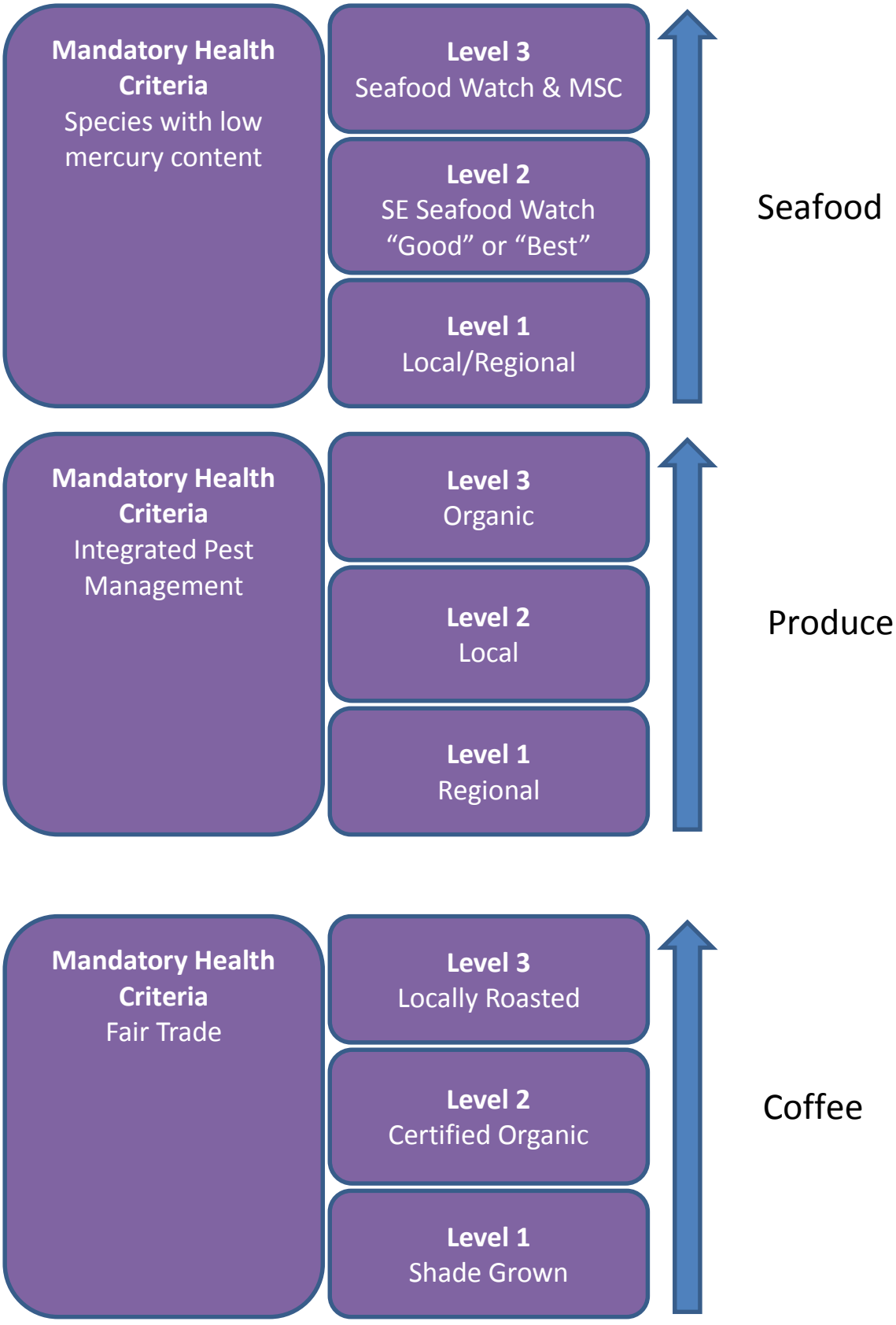
- Local: produced and processed within 150 mile radius or within the state of North Carolina; revenues under $5 million.
- Regional: Produced and processed within a 300 mile radius; revenues under $5 million.
- Integrated Pest Management: limited use of synthetic pesticides, with no use of synthetic pesticides with carcinogenic effects.
- Organic: Certified organic by the USDA or use the practices of USDA organic certification.
- Pasture raised: raised outside for the whole life of the animal, or in deep-bedded hoop houses for hogs.

Additional extremely negative characteristics should preclude a product from being sustainable. These include CAFO conditions for animals, known instances of forced labor within the last three years, or containing additives or trans fats.

This is a broad definition of sustainability, with an emphasis on health and the local economy. However, not all stakeholders will agree that these criteria make a product sustainable. Therefore, all products should be transparently labeled with which category they fulfill in the pyramid so that consumers are educated about the prioritization and have the opportunity to make informed decisions.

Figure 5. Draft sustainability definitions for each product category.




Mandatory Health Criteria
Species with low mercury content
Level 3
Seafood Watch & MSC
Level 2
SE Seafood Watch "Good" or "Best"
Level 1
Local/Regional
Seafood
Mandatory Health Criteria
Integrated Pest Management
Level 3
Organic
Level 2
Local
Level 1
Regional
Produce
Mandatory Health Criteria
Fair Trade
Level 3
Locally Roasted
Level 2
Certified Organic
Level 1
Shade Grown
Coffee

Limitations

This research drew heavily on my subjective analysis of the interviews, focus groups, and other materials, and my biases have impacted the research. I desire for Duke to create sustainable sourcing standards for dining, and this likely impacted how I viewed and coded the documents. Second, I saw discrepancies between what various stakeholders said, and was not able to reconcile these discrepancies based on the data I collected. In these situations, I reported both sides as objectively as possible. For example, the percentage of Duke's food that is currently local and the number of Farm to Fork vendors varied depending on the source. Finally, this research was part of an active process of the Campus Sustainability Committee and Food Subcommittee that I helped to facilitate. Therefore, I have a particular affinity towards the Food Subcommittee as the main collaborative body for this work.

This research also emphasized the purposive and snowball sampling approach for interviews. I spoke with faculty and staff that were involved with sustainability and dining, or had a research interest in sustainable food. Given that it is not a random sample of faculty or staff, the perspectives included in this research are likely to have biases towards improved campus sustainability. The focus groups were similarly targeted towards sustainability-minded students. I was unable to conduct a focus group with DUSDAC or DSG, which may have provided a more representative sample.

Next Steps and Conclusions

This research is a part of a larger, on-going effort to increase sustainable food on campus. During the spring 2014 semester, Charlotte Clark's Qualitative Research Methods class will conduct research on food literacy among students at Duke. This research can inform Duke Dining on how students think about food issues. In addition, Duke Dining has hired an intern to continue this work through June 2014. She will add additional insights from other schools and

gain a broader understanding of student preferences. As part of an iterative process, all of these components should work together to maximize the efficiency and increase the robustness of the sustainable sourcing standards.

Food is a basic need; we make decisions about what we eat three times a day. Food also has a large social and environmental footprint, as unseen consequences of our meal choices affect the lives of people worldwide. Duke University should follow the lead of many peer institutions to create sustainable food purchasing standards and a percentage goal for the amount of sustainable food purchased. This transparency can help give core locations a competitive advantage over contract vendors on campus, provide improved economic opportunities for the state of North Carolina and the southeast region, and create a healthier environment where students can engage actively with what they are learning in class in their everyday decisions. These draft goals are a start to an iterative process that will require commitment and consistent improvement. However, the gains in environmental safety, health and wellness, social justice, and economic stability make it worthwhile.

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Appendix 1: Interview/Focus Group questions

Interviews with Duke Administrators, faculty, and staff:

- How long have you been at Duke in any capacity?
- What roles have you played at Duke?
- Is your current role connected to food or dining? If so, how?
- How would you define "sustainable food"? (after hearing their definition, I will provide a definition that I will use throughout the rest of the interview)
- Have you noticed Duke take efforts towards sustainable food procurement during your time here? If so, what efforts have you noticed?

  If you have noticed any efforts towards sustainable food procurement, please answer the following questions about those efforts.

- What have been the biggest strengths of the efforts you have noticed?
- What are the weaknesses of those efforts?
- Do you see opportunities for future expansion of the current efforts taken towards sustainable food? If so, what are they?
- What are some of the biggest future challenges to procuring sustainable food on Duke's campus?
- Do you have ideas for efforts would you like Duke Dining to incorporate into their sustainable procurement plans?

Interviews with administrators, faculty, and staff from other schools:

- How long have you been at [your organization]?
- What is your current role at [your organization]?
- Is your current role connected to food or dining? If so, how?
- Does [your organization] have a definition of "sustainable food"? If so, please tell me about it.
- Has [your school] incorporated sustainable food procurement goals into their dining and/or sustainability plans? If so, what are the goals?
- What have been the biggest strengths of your sustainable food program?
- What are some key factors that contributed to this success?
- What are the weaknesses of your sustainable food program?
- What are the challenges to implementing sustainable food goals on a college campus?

- Do you see opportunities for future expansion of the current efforts taken towards sustainable food? If so, what are they?
- What are some of the biggest future challenges to procuring sustainable food on [your organization's] campus?
- Do you have ideas for efforts would you like [your organization] to incorporate into their sustainable procurement plans?
- What have you learned throughout the process that you wish you knew at the beginning?

Focus groups with Duke Students:

- How do you define sustainable food?
- Have you noticed any efforts to increase sustainable food options on campus? If so, what have you noticed?
- What have been the biggest strengths of the efforts you've noticed?
- What are some key factors that contributed to this success?
- What are the weaknesses of Duke's sustainable food program?
- Is there anything you would change about the current sustainable food plan at Duke? If so, what would you change?
- What would be the best way to communicate to you and your friends about the sustainable food options on campus?

Appendix 2. Emory University's Sustainable Food Purchasing Guidelines

Priorities by food category

1. Milk and dairy
   - First Priority: produced free from routine use of antibiotics and hormones
   - Second priority: sourced from certified grass fed animals (American Grass-fed Association)
   - Third Priority: from eight-state southern region
   - Fourth Priority: from Georgia
   - Fifth Priority: certified organic (USDA)
   - Sixth Priority: certified sustainable (Food Alliance or alternative certification)
   - Ultimate goal: certified sustainable and from Georgia

2. Eggs
   - First Priority: produced free from routine hormone use
   - Second priority: certified humanely raised (Humane Farm Animal Care)
   - Third Priority: from eight-state southern region
   - Fourth Priority: from Georgia
   - Fifth Priority: certified organic (USDA)
   - Ultimate goal: certified humane and sustainable and from Georgia

3. Vegetables and Fruit
   - First Priority: from Georgia
   - Second Priority: from eight-state southern region
   - Third Priority: certified organic (USDA)
   - Fourth Priority: certified Fair Trade
   - Fifth Priority: certified sustainable (Food Alliance or alternative certification)
   - Ultimate Goal: certified sustainable and from Georgia

4. Chicken
   - First Priority: produced free from routine antibiotic use
   - Second priority: certified humanely raised (Humane Farm Animal Care)
   - Third Priority: from Georgia
   - Fourth Priority: from eight-state southern region
   - Fifth Priority: certified organic (USDA)
   - Sixth Priority: certified sustainable (Food Alliance or alternative certification)
   - Ultimate goal: certified humane and sustainable and from Georgia

5. Beef
   - First priority: certified humanely raised (Humane Farm Animal Care)
   - Second priority: sourced from certified grass fed animals (American Grass-fed Association)
   - Third Priority: from eight-state southern region
   - Fourth Priority: from Georgia
   - Fifth Priority: certified sustainable (Food Alliance or alternative certification)
   - Ultimate Goal: certified grass-fed, humane, and sustainable and from Georgia

6. Pork and other meats
   - First priority: certified humanely raised (Humane Farm Animal Care)
   - Second Priority: from Georgia

Third Priority: from eight-state southern region
Fourth Priority: certified sustainable (Food Alliance or alternative certification)
Ultimate Goal: certified humane, and sustainable and from Georgia

7. Seafood
   First priority: Seafood Watch Southeast “best” or “good” list
   Second Priority: Marine Stewardship Council certification
   Third Priority: Sustainable Seafood Forum Recognition
   Ultimate Goal: all of the above

8. Grocery
   First Priority: certified organic (USDA)
   Second Priority: certified Fair Trade
   Third Priority: certified sustainable (Food Alliance or alternative certification)
   Ultimate Goal: certified sustainable